

CLAIMS

What is claimed is:

1. A system comprising:
an optical element;
5 at least one structure at least partially in and at least adjacent a surface of the optical element; and
a source of light with a mode profile that provides an electric field which has a vector component substantially perpendicular to the surface of the optical element, the source positioned to propagate at least a portion
10 of the light through the optical element on to an object, the structure enhancing the electric field of the light which optically interacts with the object.
2. The system as set forth in claim 1 further comprising a guiding system that moves at least one of the optical element with the structure or
15 the object.
3. The system as set forth in claim 1 further comprising a focusing lens positioned to focus the light from the source on to the optical element.
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4. The system as set forth in claim 1 wherein the optical element is a solid immersion lens.
5. The system as set forth in claim 1 wherein the optical
25 element is an optical waveguide.
6. The system as set forth in claim 1 wherein the structure is elongated and has at least one tip.
7. The system as set forth in claim 1 wherein the structure
30 protrudes out past the surface of the optical element.

8. The lens as set forth in claim 7 further comprising a coating over at least a portion of the structure that protrudes out past the surface of the optical element.

5 9. The lens as set forth in claim 1 wherein the optical element comprises an optical base and an optical layer connected to the optical base, the structure is at least partially in and at least adjacent to a surface of the optical layer.

10 10. The lens as set forth in claim 9 wherein the structure is elongated and protrudes out past the surface of the optical layer.

11. The lens as set forth in claim 10 further comprising a coating over at least a portion of the structure that protrudes out past the surface of the optical layer.

12. The lens as set forth in claim 9 further comprising an opening extending through the optical layer, wherein the structure is located in at least a portion of the opening.

13. The lens as set forth in claim 12 wherein at least a portion of the opening has a conical shape.

14. A method comprising:
providing an optical element with at least one structure at least partially and at least adjacent to a surface of the optical element; and
directing light with a mode profile through at least a portion of the optical element on to an object, the structure enhancing the electric field of the light which optically interacts with the object.

15. The method as set forth in claim 14 further comprising guiding at least one of the directed light or the object.

16. The method as set forth in claim 14 further comprising focusing the light on to the optical element.

17. The method as set forth in claim 14 wherein the optical
5 element is a solid immersion lens.

18. The method as set forth in claim 14 wherein the optical element is an optical waveguide.

19. The method as set forth in claim 14 wherein the structure is
10 elongated and has at least one tip.

20. The method as set forth in claim 14 wherein the structure protrudes out past the surface of the optical element.

21. The method as set forth in claim 20 further comprising a
15 coating over at least a portion of the structure that protrudes out past the surface of the optical layer.

22. The method as set forth in claim 14 wherein the provided
20 optical element comprises an optical base and an optical layer connected to the optical base, the structure is at least partially in and at least adjacent to a surface of the optical layer.

23. The method as set forth in claim 22 wherein the structure is
25 elongated and protrudes out past the surface of the optical layer.

24. The method as set forth in claim 23 further comprising a
30 coating over at least a portion of the structure that protrudes out past the surface of the optical layer.

25. The method as set forth in claim 22 further comprising an opening extending through the optical layer, wherein the structure is located in at least a portion of the opening.

5 26. The method as set forth in claim 25 wherein at least a portion of the opening has a conical shape.

27. A lens comprising:
an optical element; and
10 a structure at least partially in and at least adjacent a surface the optical element.

28. The lens as set forth in claim 27 wherein the structure is elongated and has at least one tip.

15 29. The lens as set forth in claim 27 wherein the structure protrudes out past the surface of the optical element.

20 30. The lens as set forth in claim 29 further comprising a coating over at least a portion of the structure that protrudes out past the surface of the optical layer.

31. The lens as set forth in claim 27 wherein the optical element comprises an optical base and at least one optical layer connected to the optical base, the structure is at least partially in and at least adjacent to a surface of
25 the optical layer.

32. The lens as set forth in claim 31 wherein the structure is elongated and protrudes out past the surface of the optical layer.

30 33. The lens as set forth in claim 32 further comprising a coating over at least a portion of the structure that protrudes out past the surface of the optical layer.

34. The lens as set forth in claim 31 further comprising an opening extending through the optical layer, wherein the structure is located in at least a portion of the opening.

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35. The lens as set forth in claim 34 wherein at least a portion of the opening has a conical shape.

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36. A method for making a lens, the method comprising:
providing an optical element;
forming at least one opening in a surface of the optical element; and
depositing a material in the at least one opening to form a structure.

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37. The method as set forth in claim 36 wherein the structure is elongated and has at least one tip.

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38. The method as set forth in claim 36 wherein the structure protrudes out past the surface of the optical element.

39. The method as set forth in claim 36 further comprising coating over at least a portion of the structure in the at least one opening.

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40. The method as set forth in claim 27 wherein the providing the optical element further comprises connecting an optical layer to an optical base, wherein the forming the at least one opening is at least partially in and at least adjacent to a surface of the optical layer and the depositing the material is in the at least one opening.

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41. The method as set forth in claim 40 wherein the structure is elongated and protrudes out past the surface of the optical layer.

42. The method as set forth in claim 43 further comprising a coating over at least a portion of the structure that protrudes out past the surface of the optical layer.

5 43. The method as set forth in claim 40 wherein the forming the opening further comprises forming the opening to extend through the optical layer.

10 44. The method as set forth in claim 44 wherein the forming the opening further comprises forming at least a portion of the opening to have a conical shape.

45. A system comprising:
at least one optical element;
15 at least one structure positioned to optically interact with the optical element; and
a source of light with a mode profile that provides an electric field which has a vector component substantially perpendicular to a surface of the optical element, the optical element focusing at least a portion of the
20 light on to at least a portion of the structure, the structure enhancing the electric field of the light which optically interacts with an adjacent object.

46. The system as set forth in claim 45 further comprising a guiding system that moves at least one of the optical element or the object.
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47. The system as set forth in claim 45 wherein the at least one optical element is at least one elliptical shaped mirror.

48. The system as set forth in claim 45 wherein the structure is
30 elongated and has at least one tip.

49. A method comprising:
providing at least one optical element and at least one
structure positioned to optically interact with the optical element; and
directing light with a mode profile with the optical element
5 on to at least a portion of the structure, the structure enhancing the electric field of
the light which optically interacts with an adjacent object.

50. The method as set forth in claim 49 further comprising
guiding at least one of the directed light or the object.
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51. The method as set forth in claim 49 wherein the at least one
optical element is at least one elliptical shaped mirror.

52. The method as set forth in claim 49 wherein the structure is
15 elongated and has at least one tip.